

Spring 2019

# CHEM 122-102: Fundamentals of Chemical Principles II

Munirathna Padmanaban

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## Recommended Citation

Padmanaban, Munirathna, "CHEM 122-102: Fundamentals of Chemical Principles II" (2019). *Chemistry and Environmental Science Syllabi*. 61.

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**Chemistry 122:**  
*Spring 2019 Course*  
*Syllabus*

[NJIT Academic Integrity Code](#): All Students should be aware that the Department of Chemistry & Environmental Science (CES) takes the University Code on Academic Integrity at NJIT very seriously and enforces it strictly. This means that there must not be any forms of plagiarism, i.e., copying of homework, class projects, or lab assignments, or any form of cheating in quizzes and exams. Under the University Code on Academic Integrity, students are obligated to report any such activities to the Instructor.

**COURSE INFORMATION**

Course Description: Chem 122

Number of Credits: 3

Prerequisites: A C or higher in Math 110 or equivalent

Course-Section and Instructors

Course-Section	Instructor
Chem 122:	Dr. Munirathna Padmanaban (Pad)

Office Hours: Tuesdays 3-5 pm, Thursdays 12noon - 1pm.

Office room: Tiernan 323A (by appointment, text 908-635-3859 or email pad08807@njit.edu)

Required Textbook:

Title	Chemistry: A Molecular Approach
Author	Zumdahl and Zumdahl
Edition	Tenth Edition
Publisher	Cengage
ISBN #	ISBN-13: 9781305256712

**University-wide Withdrawal Date:** The last day to withdraw with a **W** is Monday, April 8, 2019. It will be strictly enforced.

### Learning Outcomes:

1. Define Reaction Rate, relate reaction rate to stoichiometry and determine order of a reaction
2. Describe the factors affecting reaction rate
3. Use kinetic data to write reasonable reaction mechanisms
4. Explain equilibrium and equilibrium constants
5. Understand the concept of equilibrium constant and the reaction quotient, Q
6. Use equilibrium constant to determine the direction of reaction and product yield in the context of various chemical reactions
7. Use Le Chatelier's principle to determine direction of reaction
8. Understand different definitions of acids and bases
9. Explain the autoionization of water and the concept of pH to discuss acid/base strength
10. Define and perform calculations relating to acid and base dissociation constant
11. Explain the concept of buffer solution and their importance
12. Perform calculations to show the efficiency of buffer solutions
13. Interpret equilibrium constants  $K_{sp}$  and discuss solubility of sparingly soluble salts
14. Interpret titration curves and calculate the pH of the solution during titration of strong and weak acids versus base
15. Understand and explain energy transformations in chemical reactions
16. Explain entropy, Gibbs free and the second and third law of thermodynamics.
17. Determine whether a reaction is spontaneous
18. Calculate thermodynamic parameters  $\Delta G$ ,  $\Delta S$ ,  $\Delta H$  and relate the equilibrium constant to these parameters
19. Balance redox reaction and write oxidation and reduction half -reaction
20. Calculate the cell potential for a redox reaction in a galvanic cell
21. Relate cell potential to thermodynamic parameters and determine the direction of spontaneity
22. Use Faraday's law to determine the amount of material deposited during electroplating
23. Explain electrolysis and overvoltage
24. Differentiate between chemical reaction and nuclear reaction
25. Balance nuclear equations and describe the particle emitted during the process
26. Predict the type of emission from unstable nuclides
27. Use mass -energy relationship to calculate the energy released during nuclear processes
28. Distinguish between nuclear fission and fusion
29. Describe the applications of nuclear reaction s in energy production
30. Name simple organic compounds and the basic function al groups
31. Write reactions of alkanes, alkenes and alkynes

### POLICIES

All CES students must familiarize themselves with, and adhere to, all official university-wide student policies. CES takes these policies very seriously and enforces them strictly.

In addition, obtaining course materials such as past exams or solutions to homework and/or class assignments from external sources constitutes as cheating. The official Student's Solutions Guide is exempt. Posting of course materials on external websites without the approval of the instructor violates intellectual property laws and hence strictly forbidden. Any student caught cheating on homework will be assessed a penalty of 20 points, in addition to a grade of zero for the given homework assignment.

Students are encouraged to seek help from their Instructors during office hours.

**Grading Policy:** The final grade in this course will be determined by a point total based on the following:

Homework (Basic HW: 60 + Regular HW 100) points	160
Class Participation (recitation + lecture)	190
Common Exam I	125
Common Exam II	125
Common Exam III	125
Final Exam	275
Total points	1000

Your final letter grade in this course will be based on the following tentative curve:

A	>835	C	600-659
B+	775-834	D	550-599
B	710-774	F	< 550
C+	660-709		

**You must maintain an average of 35%, which is 228 points in the common exams and finals to be considered for a grade of D or higher. You will receive an F even if you have adequate point total without this requirement.**

**Attendance Policy:** Attendance at classes will be recorded and is **mandatory**. Each class is a learning experience that cannot be replicated through simply “getting the notes.”

Lecture: An I-clicker and calculator are required for all lectures. If your iclicker malfunctions, you are required to inform the instructor, either in person or via e-mail the **same day**. Failure to notify the instructor will result in loss of points for that day. If you are in class, but using a cell phone in any way, using a computer, or listening to music you will not get credit for that day's attendance. If you are cheating (having a second I-clicker) you and the person for whom you are cheating will get 0 for the entire semester. There are ways to check! So, be honest.

In class worksheets: You are expected to come prepared to each class period by reviewing the textbook/slides in moodle. During each class period, the instructor will ask questions and/or be given a worksheet to solve. The worksheets are collected at the end of the recitation and graded. Students who did not succeed in completing the worksheet during the recitation have one week time to complete the worksheets during office hours. Students who miss a class for a valid reason must still make up the worksheet to get credit.

**Homework Policy:** There are two types of homework: Basic and Regular.

Basic Homework, worth 60 points: It is recommended that you do the basic HW for the chapter before coming to the lecture. This homework is intended as a preparation for your participation in class. Getting > 70% in the basic homework before the lecture, will ensure you have the foundation necessary to understand what is being taught in class.

Regular homework, worth 100 points: This homework is to test your understanding of the material being taught. This homework will build on the classroom content and enhance your understanding of the material. This homework will also be good preparation for the common exams.

All homework is very important. However, it is important that you aim to get > 90% in the basic and >70% in the regular HW to help you pass this class.

Each homework assignment has it due date. In addition, Moodle has a calendar with due dates. **ALL HOMEWORK MUST BE DONE ON TIME. There is no credit for late homework. DO NOT WAIT TO THE LAST MINUTE TO DO YOUR HOMEWORK. ONLINE SYSTEMS ARE NOT 100% RELIABLE AND UNEXPECTED EVENTS MAY OCCUR. IN GENERAL, THERE IS NO LATE HOMEWORK AND MOODLE BEING DOWN IS NOT A VALID EXCUSE. PLAN TO FINISH YOUR HOMEWORK AT LEAST ONE DAY BEFORE IT IS DUE.**

**Exams:** There will be three midterm exams held in class during the semester and one comprehensive final exam. The following exam periods are tentative and therefore possibly subject to change:

Common Exam I	Monday 4:30 - 5:45pm - 2/18/19
Common Exam II	Monday 4:30 - 5:45pm - 4/1/19
Common Exam III	Monday 4:30 - 5:45pm - 4/29/19
Final Exam Period	May 10 <sup>th</sup> to 16 <sup>th</sup>

The final exam will test your knowledge of all the course material taught in the entire course.

**TEST GRADING ERROR.** Tests are returned in recitations following the test. If you believe there is an error, you have until the Thursday following the test to submit a test for regrading. You must write a very brief description of the problem on the back of the test. (The answer key is provided in Moodle in the TEST INFORMATION book. You should always learn from your mistakes and go over the answer key.)

ALL ERRORS NEED TO BE BROUGHT TO THE INSTRUCTOR'S ATTENTION WHEN THEY OCCUR. DO NOT WAIT UNTIL THE END OF THE SEMESTER

**Makeup Exam Policy:** There will normally be **NO MAKE-UP QUIZZES OR EXAMS** during the semester. In the event that a student has a legitimate reason for missing a quiz or exam, the student should contact the Dean of Students office and present written verifiable proof of the reason for missing the exam, e.g., a doctor's note, police report, court notice, etc. clearly stating the date AND time of the mitigating problem. The student must also notify the CES Department Office/Instructor that the exam will be missed. **One cumulative make-up examination** will be permitted at the end of the semester if there is an acceptable and substantial reason. A grade of zero will be given for a second missed examination independent of reason. **Tentative date of the makeup exam is May 3<sup>rd</sup> at 7.00 am.**

**Cellular Phones:** All cellular phones and other electronic devices must be switched off during all class times. Such devices must be stowed in bags during exams or quizzes.

## ADDITIONAL RESOURCES

**Chemistry Tutoring Center:** Located in the Central King Building, Lower Level, Rm. G12. Students can get help from peer tutors on a "walk-in" basis. There is no private tutoring available, however if the center is not too busy, you may be able to get more personal attention. In this peer tutoring model, tutors are taught to encourage interaction among students to promote learning.

Hours of operation are Monday - Friday 10:00 am - 6:00 pm. For further information please click [here](#).

**Accommodation of Disabilities:** Office of Accessibility Resources and Services (**formerly known as Disability Support Services**) offers long term and temporary accommodations for undergraduate, graduate and visiting students at NJIT.

If you are in need of accommodations due to a disability please contact Chantonette Lyles, Associate Director at the Office of Accessibility Resources and Services at **973-596-5417** or via email at [lyles@njit.edu](mailto:lyles@njit.edu). The office is located in Fenster Hall Room 260. A Letter of Accommodation Eligibility from the Office of Accessibility Resources Services office authorizing your accommodations will be required.

For further information regarding self-identification, the submission of medical documentation and additional support services provided please visit the Accessibility Resources and Services (OARS) website at:

- <http://www5.njit.edu/studentsuccess/disability-support-services/>

**Important Dates** (See: [Fall 2018 Academic Calendar, Registrar](#))

Month	Date	Day	Event
January	21	Monday	Martin Luther King, Jr. Day
January	22	Tuesday	First Day of Classes
February	2	Saturday	W Grades Posted for Course Withdrawal
March	17-24	Sunday	Spring Recess Begins
April	8	Monday	Last Day to Withdraw
April	19	Friday	Good Friday - University Closed
May	7	Tuesday	Last day of classes: Friday Classes Meet
May	8 <sup>th</sup> -9 <sup>th</sup>	Wed- Thurs	Reading Days

## Course Outline

This is a second part in a 2 course Chemistry sequence. This course builds on content from Chem 125. So, it is expected that the student will have reviewed Chapters 1-14 before starting this course.

Week	Outcomes	Topic	Homework
1	1,2	Chapter 12: Chemical Kinetics	Warm up Basic HW Basic HW: Review of graphing Chapter 12 Basic HW I Chapter 12 Regular HW I
2	1,2,3	Chapter 12: Chemical Kinetics	Basic HW: Unit Conversions Chapter 12 Basic HW II Chapter 12 Regular HW II
3	4,5	Chapter 13: Chemical Equilibrium	Basic HW Review: Balancing Eq Chapter 13 Basic HW I Chapter 13 Regular HW I
<b>EXAM 1: Chapters 12-13</b>			
4	4,5,6,7	Chapter 13: Chemical Equilibrium	Chapter 13 Basic HW II Chapter 13 Regular HW II
5	8, 9	Chapter 14: Acids and Bases	Chapter 14 Basic HW I Chapter 14 Regular HW I
6	8,9, 10, 11, 12	Chapter 15: Acids and Bases	Chapter 15 Basic HW II Chapter 15 Regular HW II
<b>EXAM 2: Chapters -14 -15,16</b>			
7	12,13,14	Chapter 16: Aqueous Ionic Equilibrium	Chapter 16 Basic HW I Chapter 16 Regular HW I
8	15,16	Chapter 17: Free Energy and Thermodynamics	Chapter 17 Basic HW I: Review of Thermochemistry Chapter 17 Regular HW

9	17,18	Chapter 17: Free Energy and Thermodynamics	Chapter 17 Basic HW II Chapter 17 Regular HW II
10	19,20,21	Chapter 18: Electrochemistry	Chapter 18 Warm up-Oxidation States Chapter 18 Basic HW I Chapter 18 Regular HW I
<b>EXAM 3: Chapters 17-18</b>			
11	21, 22, 23	Chapter 18: Electrochemistry	Chapter 18 Basic HW II Chapter 18 Regular HW II
12	18, 19,20	Chapter 19: Radioactivity and Nuclear Chemistry	Chapter 19 Basic HW I Chapter 19 Regular HW I
13	21	Chapter 20: organic Chemistry	Chapter 20 Regular HW
14	1 - 21	<b>FINAL EXAM Review</b>	Basic: Chapters 1-8 Basic Chapters 9-11 ACS reviews: I and II

*Updated by Balasubramanian- 2019  
Department of Chemistry & Environmental Sciences*

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*Course Syllabus, Spring 2019*